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LEEWARD ISLANDS *TYPHLOPS*  
(REPTILIA, SERPENTES)

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Snakes of the genus *Typhlops* Oppel have long been known to inhabit some of the Leeward Islands (Boulenger, 1893; Barbour, 1914), but it was Parker (1933) who first indicated their true relationships by placing them with *T. jamaicensis* Shaw. At that time specimens of *Typhlops* were known from St. Christopher, Antigua and Montserrat, but there were not enough to delimit variation. Recent collecting has produced substantial series of specimens from Antigua and Montserrat; a few other specimens have also been taken on St. Christopher, Nevis, and Barbuda. The related Puerto Rican and Virgin Island species, *T. richardi* Duméril and Bibron, has been dealt with (Thomas, 1966), but study of the Leeward Islands form was not undertaken at that time for lack of material.

To Dr. Albert Schwartz I am most indebted for his sponsorship of the collecting and study of the Leeward Islands *Typhlops*. I also wish to thank the following people for the loan of specimens in their care: Drs. Doris Cochran and James A. Peters, U. S. National Museum (USNM); Miss Alice G. C. Grandison, British Museum (Natural History) (BMNH); Dr. Walter Auffenberg, University of Florida Collections (UF). Mr. A. F. Stimson of the British Museum made comparisons with a syntype of *Anilius leachii*, for which he has my sincere thanks.

Additionally, institutions in which typical specimens of the new taxa described below have been deposited are designated as follows: MCZ, Museum of Comparative Zoology at Harvard; CM, Carnegie Museum; UIMNH, University of Illinois Museum of Natural History; KU, Museum of Natural History, University of Kansas. ASFS designates the Albert Schwartz

Field Series, and RT designates the Richard Thomas private collection.

#### METHODS AND TERMINOLOGY

*Labial flare of rostral:* The rostral of some forms widens noticeably at the labial border; this labial flare is numerically expressed as the ratio of the width of the rostral at the level of the nares to the widest point of the labial flaring.

*Apical flare of rostral:* The rostral of some forms widens noticeably on the apex of the snout; this is expressed numerically as the ratio of the narrowest point of the rostral in ventral aspect to the greatest width on the apex of the snout. (All such measurements are made with an ocular micrometer.)

*Scale row reduction:* Reduction of scale rows occurs on the ventral surface by fusion of the first two paramedian rows, or sometimes by fusion of the midventral row with the first paramedian row. The level of reduction is indicated as the number of midventral scales posterior to the mental at which fusion of rows takes place. As reduction is not necessarily symmetrical (e.g., 22 rows may reduce to 21 and then to 20 shortly thereafter), only the final reduction of a major reduction is usually given; i.e., for the major reduction from 22 to 20 rows (or 20 to 18) the level at which reduction from 21 to 20 (or 19 to 18) occurs is all that is stated. When abnormal redivision and refusion occurs, reduction is indicated as the level at which the fusion occurs that continues for a greater distance than those preceding it. If redivision and refusion is too erratic, a count is not taken. It should be noted that for the posterior reduction the procedure used here is a change from that used with *T. richardi* (Thomas, 1966) in which the posteriormost reduction was given as the number of midventral scales anterior to the vent.

*Pigmented scale rows:* Pigmented rows are counted around a zone at approximately midbody using a dissecting microscope. The ventralmost two rows on a side are counted as one if the number of pigmented scales in them is complementary (i.e., if the pigmented scales in both would together form a nearly solidly pigmented row), or if the pigmented scales in the lowermost row are very sparse (distinctly less than half).

Boulenger (1893) listed *Anilios leachii* Gray, 1845 (no type-locality), as a synonym of *Typhlops lumbricalis* Linnaeus. Primarily because of the name *leachi*, which has been applied to a Leeward Islands iguanid lizard (*Anolis bimaculatus leachi* Duméril and Bibron), it was thought best to determine precisely the application of the name *Anilios leachii*. I have examined one of the two syntypes (BMNH 1946-1.12.5) and, although exceptionally large, it unquestionably is a specimen of *Typhlops jamaicensis* (a species I consider to be restricted to Jamaica). The specimen, an adult female, measures 425 mm total length, tail 7 mm; middorsal scales 442; scale rows 22, unreduced posteriorly; details of

head scalation like those of *T. jamaicensis* with the rostral flaring prominently on the apex of the snout but having no appreciable labial flare. The other syntype was examined for me by Mr. Stimson, who reported that it agrees with *T. jamaicensis* in the details of scalation just mentioned, rather than with the Leeward Islands form. Thus, *Anilius leachii* is a junior synonym of *Typhlops jamaicensis* and is not pertinent to the problem of the Leeward Islands *Typhlops*.

The Leeward Islands *Typhlops*, although related to *T. richardi* and *T. jamaicensis*, are best considered a separate species which may be called, in a somewhat indirect allusion to one of the islands which they inhabit,

***Typhlops monastus*, new species**

**Diagnosis:** A species of *Typhlops* of the *jamaicensis* complex characterized by having 22 scale rows anteriorly, reducing to 20 scale rows on the posterior portion of the body in most specimens.

**Range:** Presently known from the West Indian islands of St. Christopher, Nevis, Montserrat, Antigua, and Barbuda.

***Typhlops monastus monastus*, new subspecies**

**Holotype:** MCZ 81112, an adult male, collected between Lawyers River and Cassava Chaut, St. Peter's Parish, Montserrat, British West Indies, 5 August 1965, by Richard Thomas.

**Paratypes:** BRITISH WEST INDIES, MONTSERRAT: BMNH 1931.10.18.158-59, 1934.4.1.2.; St. Peter's Parish: ASFS V6674-78, Cassava Chaut, 1 August 1965, R. Thomas; ASFS V6698-701, same data as holotype, 1 August 1965, R. Thomas; CM 40591, Sweeneys (SE Carr's Bay), 2 August 1965, R. Thomas; USNM 157905-06, same data as holotype, 4 August 1965, R. Thomas; UIMNH 61659-60, 0.6 mi. N Salem Village, 6 August 1965, R. Thomas; MCZ 81113, UF 21510-11, RT 1337, same data as holotype, 6 August 1965, R. Thomas; ASFS V6793-95, same data as holotype, hatched 3 September 1965, from eggs collected 1 August 1965, R. Thomas; St. Anthony's Parish: BMNH 1924.2.19.9-11, Richmond (Estate?); MCZ 81114, taken from gizzard of *Falco sparverius* collected west slope, South Soufriere, 1400 feet, 5 April 1962, R. F. Klinikowski; ASFS 19394, west slope, South Soufriere, 1300 feet, 7 April 1962, A. Schwartz; CM 40592, approx. 0.75 mi. NE Upper Galway's Estate, 2 August 1965, R. Thomas; ASFS V6720, south side Belham River near mouth, 3 August 1965, R. Thomas; AMNH 94165-66, approx. 0.5 mi. N Roche's Estate, 4 August 1965, R. Thomas.

**Diagnosis:** The nominate subspecies of *T. monastus*, characterized by a high number of middorsal scales, a low degree of labial flare of the rostral, a greater number of pigmented scale rows, and pigmentation extending onto underside of tail.

**Range:** As presently known, the island of Montserrat.

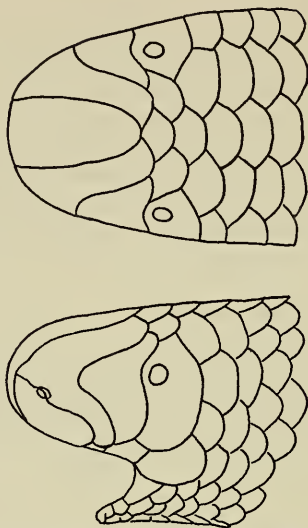


FIG. 1. Dorsal and lateral views of the head of the holotype of *Typhlops monastus monastus* (MCZ 81112).

*Description of holotype* (Fig. 1): Head tapers slightly from eighth middorsal scale, snout blunt and rounded. Rostral scale oval in dorsal aspect, slightly less than one-third head width at eyes; rostral narrower in ventral aspect, labial flare slight (.81), apical flare absent, posterior extent dorsally to just anterior to preocular-ocular suture. Nasals only narrowly separated from contact behind rostral; nasal sutures complete from second supralabials to rostral edge. Preocular roughly half as long as high, its anterior extension rounded; preocular in contact with third but not second supralabial. Ocular roughly half as long as high, ocular-preocular suture sinuate; two postoculars not elongate and about size of normal body scale; dorsal extent of upper postocular to above eye. Parietals 4, equal in size, only slightly enlarged and not elongate, anteriormost pair extend ventrally along ocular to level of dorsal edge of eye; supraoculars slightly smaller than parietals; eye size moderate. Middorsal scales from rostral to caudal spine 377; scale rows 22 anteriorly, reducing to 20 at level of 254th midventral scale posterior to mental; midventral scales mental to vent 365. Total length of holotype 184 mm, tail 6 mm, midbody diameter 4.7 mm. Everted hemipenes short (less than half length of tail), clavate with flattened trumpetlike apices and no ornamentation; sulcus spermaticus enters organ on medial surface, spirals posteriorly and laterally onto anterior surface, proceeds directly onto apical face.

*Coloration:* Gray-brown dorsally, head pigmented except for light



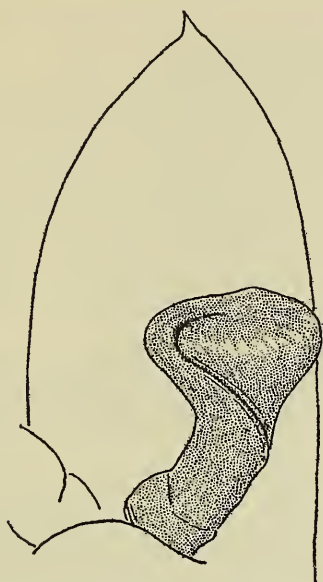


FIG. 2. Everted right hemipenis of *Typhlops monastus* (CM 40594).

scale edges, labials, and lower halves of nasals and rostral; body coloration fades somewhat on sides but zone of juncture with ventral coloration is abrupt, but irregular, caused by all-or-nothing pigmentation of individual scales; pigmented rows 13; venter off-white, probably pinkish in life; caudal light ring or notch absent, pigmentation extending completely around tail.

*Variation:* Head shape and arrangement and general shape of head scales of paratypes are like those of holotype; nasals broadly separated (but less than prefrontal width) to nearly in contact behind rostral; rostral extends posterior to a level just anterior to ocular or, in one or two specimens, to a level with the anterior edge; labial flare of rostral .72-.94. Middorsal scales 351-394 (mean 378.6) in type-series; reduction to 20 scale rows occurs from 187 to 299 (mean 250.7) scales posterior to mental in the midventral line; one specimen (BMNH 1931.10.18.158) does not reduce from 22 rows, another (BMNH 1924.2.19.10) reduced only to 21 rows ten scales anterior to the vent. Midventral scales 346-385 in 22 paratypes. Largest specimen measures 258 mm total length, tail 6 mm. Hemipenes are everted on five specimens besides the holotype, and are similar to the illustrated example (Fig. 2). Coloration of paratypes is much like that of the holotype; extension of pigment onto ventral part of tail occurs to some degree in all specimens; pigmented scale rows on body are 13 (16 specimens) or 15 (15 speci-

mens). Detailed reductions and measurements of labial flare were not determined for the three hatchlings.

Evans (1955) has described the osteology of *Typhlops monastus* based on 19 specimens from Montserrat. The number of vertebrae was given for 17 specimens (range 200–205). Regrettably, scale counts were not given and there is no way of determining the ratio of vertebrae to middorsal scales on an individual basis, as has been done by Gans and Taub (1965) for several East African species of *Typhlops*. However, comparison of the vertebral range obtained by Evans with the range of middorsal scales in the type-series of *T. m. monastus* (351–394) indicates that a ratio (vertebrae : middorsals) intermediate between 1 : 2 and 2 : 3 probably occurs in this population.

***Typhlops monastus geotomus*, new subspecies**

*Holotype*: MCZ 81115, an adult, collected approximately 1 mi. N Carlisle, St. Mary's Parish, Antigua, British West Indies, 8 August 1965, by Richard Thomas.

*Paratypes*: BRITISH WEST INDIES, ANTIGUA: USNM 142038, W. L. Schmitt, BMNH 65.5.4.144, BMNH 94.9.20.9–10, BMNH 99.6.29.16, BMNH 1927.4.20.33; St. George's Parish, Gunthorpes, BMNH 1940.2.4.42; St. Paul's Parish, ASFS V6767–71, Sweets Village, 7 August 1965, R. Thomas; St. Mary's Parish, CM 40593–94, KU 93352–53, AMNH 94267–68, UIMNH 61661–62, same locality as holotype, 7 August 1965, R. Thomas; UF 21512–13, MCZ 81116–18, same data as holotype; Great Bird Island: ASFS V6791, 11 August 1965, R. Thomas. BARBUDA: Codrington: USNM 137827, G. A. Seaman; UF 11376, 30 June 1958, Wayne King. St. CHRISTOPHER: ASFS 19789, Christ Church Nichola Town Parish, 3 mi. SW Molyneux, 4 May 1962, A. Schwartz; UF 11395, St. Thomas Middle Island Parish, 3.5 mi. N, 8 mi. W Basseterre, 11 July 1958, Wayne King. NEVIS: ASFS 19783, St. George Gingerland Parish, White Bay, 1 May 1962, R. F. Klinikowski.

*Diagnosis*: A subspecies of *T. monastus* differing from the nominate race in having fewer middorsal scales, a higher degree of labial flare, and reduced pigmentation shown in the fewer pigmented scale rows and the lack of ventral caudal pigmentation.

*Range*: Presently known from the West Indian islands of St. Christopher, Nevis, Antigua, Barbuda, and Great Bird, a satellite of Antigua.

*Description of holotype*: Head tapers slightly from about seventh middorsal scale; snout blunt and rounded. Rostral scale elongate, oval in dorsal aspect, about one-third head width at eyes; rostral narrower in ventral aspect, labial flare moderate (.74), apical flare absent, posterior extent of rostral dorsally to slightly anterior to ocular. Nasals narrowly separated from contact behind rostral; nasal sutures complete from second supralabials to rostral edge. Preocular roughly half as long as high, its anterior extension rounded; preocular in contact with third but not second supralabial. Ocular roughly half as long as high, ocular-

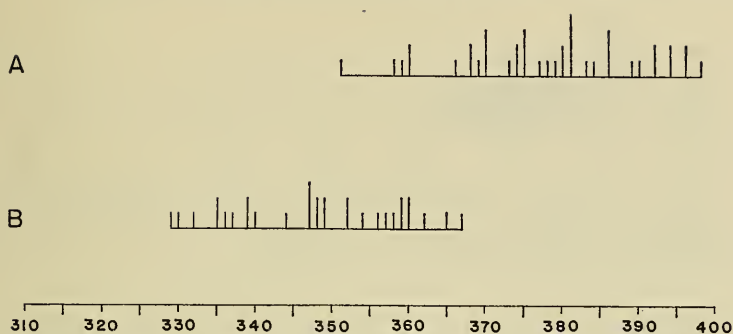


FIG. 3. Histogram of middorsal scale counts (abscissa) in *T. m. monastus* (A) and *T. m. geotomus* (B); the smallest vertical unit represents one individual.

preocular suture sinuate; two postoculars not elongate, about size of normal body scale, extent of dorsal postocular to above eye. Parietals 4, equal in size, only slightly enlarged, equal to about two neck scales (right second parietal somewhat reduced), anteriormost pair extend ventrally along ocular to level of top of eye; supraoculars slightly smaller than parietals; eye moderate in size, placed anteriorly in ocular scale. Middorsal scales from rostral to caudal spine 347; scale rows 22 anteriorly, reducing to 20 at level of 135th midventral scale posterior to mental; midventral scales mental to vent 338. Total length of holotype 196 mm, tail 5 mm, midbody diameter 4.9 mm.

**Coloration:** Gray-brown dorsally on body and on head excluding lower halves of nasals and rostral; body color fades gradually on sides but is nevertheless dichotomously distinct from whitish ventral color; pigmentation does not extend to underside of tail, slight indication of a caudal notch is present near tip.

**Variation:** Morphologically the paratypes show essentially the same variation noted for the nominate race. Labial flare of rostral significantly greater, varying from .61–.74. Middorsal scales 329–367 (mean 348.4) in type series. Reduction to 20 scale rows occurs from 138 to 231 (mean 207.9) midventral scales posterior to mental in 28 specimens. All specimens reduce to 20 rows. Midventral scales 316–350 in 19 paratypes. The largest specimen measures 213 mm total length, tail 5 mm. Hemipenes are everted in eight specimens and are like those described for the holotype of *monastus*. Coloration of paratypes is like that of the holotype; extension of pigment onto ventral portion of tail or pronounced caudal notches or rings do not occur. Pigmented scale rows are 9 (1 specimen), 11 (25 specimens), or 13 (6 specimens).

**Intraspecific comparisons:** The two races of *T. monastus* are distinguished by the following characters: 1) middorsal counts (Fig. 3) in which, although there is a large overlap of range, only 15 percent of

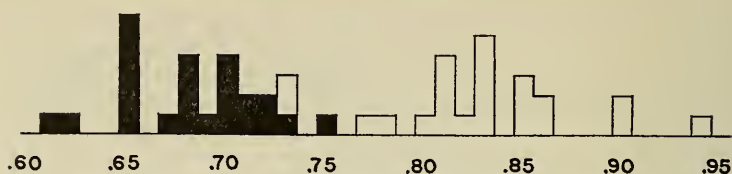


FIG. 4. Histogram showing labial flare of rostral (abscissa) in *T. m. monastus* (hollow blocks) and *T. m. geotomus* (solid blocks); the smallest vertical unit represents one individual.

the specimens of *monastus* overlap the counts of *geotomus*; 2) pigmented rows, in which 79 percent of the *geotomus* specimens are separable from all specimens of *monastus*, although because of the small total range all specimens of *geotomus* are distinct from only 47 percent of the *monastus*; 3) labial flare (Fig. 4), in which 91 percent of the *geotomus* have a higher degree of flare than all specimens of *monastus*; 4) pigmentation of the underside of the tail (*monastus*) versus its lack (*geotomus*) appears to yield a complete separation. (BMNH specimens were not used in the determination of labial flare, or ventral tail pigmentation because they had been returned before these characters were employed. Hatchlings were not used in the computation of labial flare.)

The distributional picture presented by the races of *T. monastus* is interesting because the race *geotomus* appears to occupy both the volcanic islands of St. Christopher and Nevis and the predominantly calcareous second-cycle islands (older, limestone capped) of the Antigua Bank. Montserrat, lithologically similar to St. Christopher and Nevis, bears a separate race. No ready explanation presents itself, but unequal evolutionary rates, or asynchronous dispersal in the Leewards are two possibilities. The tendency towards reduced number of pigmented rows appears to be correlated with the dryer habitats; this condition is also seen in the Virgin Islands races of *T. richardi* (Thomas, 1966).

*Interspecific comparisons:* *Typhlops monastus* has been called a *jamaicensis*-group member because its most obvious comparisons are with *T. jamaicensis* and *T. richardi*. Whether this group is a definable entity is another matter. Its members are characterized by general (but not detailed) similarity in the configuration of head scales, in the dorsal aspect of the head which is slightly tapering and roughly ogival to blunt in outline, in dorsal coloration which ends abruptly in an irregular zone of juncture with the light ventral color (not a trait of *T. r. richardi* and some *T. r. platycephalus*) in having 22 scale rows, at least anteriorly, and in having high middorsal scale counts (ca. 330 to 400+). A comparatively large caudal spine also seems to characterize this group. None of these characters are entirely lacking in other groups of *Typhlops*. I concur with Legler's (1959) suggestion that *T. monensis* Schmidt might be a member of this group. Having examined both living and



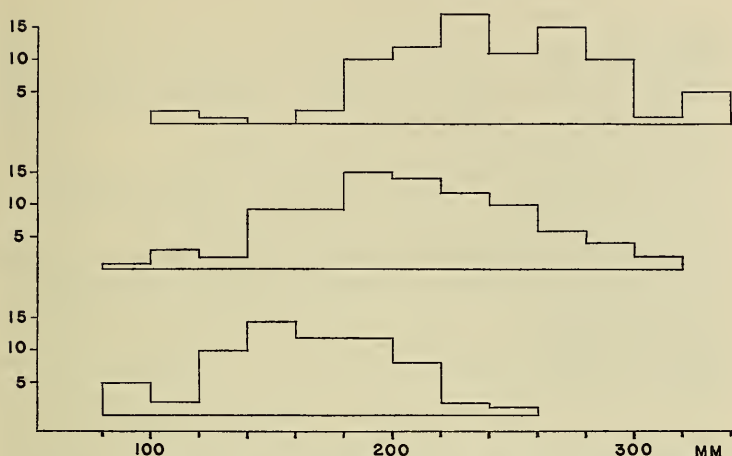


FIG. 5. Histograms of total lengths (abscissa) in three species of *Typhlops*: *jamaicensis* (top), *richardi* (middle), *monastus* (bottom). The syntype of *Anilius leachii* examined (425 mm total length) was not included in the *jamaicensis* histogram. The number of individuals is indicated on the ordinate of each graph.

preserved *monensis*, I believe it likely to be a derivative of *richardi*, which it resembles in coloration, head shape and caudal spine development, and not a relative of *T. lumbricalis* Linnaeus, as has been assumed in the past.

By its small size, *monastus* differs from both *T. jamaicensis* and *T. richardi* (Fig. 5), although in the latter there is some geographic variation in size. From *jamaicensis*, *monastus* differs further in having a narrower rostral, in lacking the prominent apical flare of the rostral, and in the reduction to 20 scale rows (*jamaicensis* reduces to 20 or 21 rows exceptionally and very far posteriorly; two specimens of *monastus* do not reduce to 20 rows). Hemipenially *monastus* and *jamaicensis* are similar in having relatively short, terminally enlarged, trumpetshaped organs; however, *monastus* appears to lack the distinctive peripheral sulcus around the apex of the organ found in *jamaicensis* (see Thomas, 1966; Fig. 5). From *richardi*, *monastus* differs principally in hemipenial structure, the former having a very long, slender organ with no terminal expansion but with a prominent basal expansion which may provide the necessary retaining mechanism during copulation. The anterior border of the ocular is more sinuous in *monastus* in which there is a curvature that accommodates the eye; in *richardi* the curvature is less pronounced or absent. The lower half of the ocular is concave in *monastus* but straight in the majority of *richardi* specimens. *T. monastus* additionally differs on the average from *richardi* in further posterior reduction of scale rows.

From other West Indian *Typhlops*, *monastus* is distinguished by the following characters:

1. 22 scale rows versus 20 or fewer in: *lumbricalis*, *sulcata* Cope, *capitulata* Richmond, *haitiensis* Richmond, *caymanensis* Sackett, *rostellata* Stejneger, *granti* Ruthven and Gaige, *monensis*.
2. 22 scale rows versus 24 (anteriorly) in: *dominicana* Stejneger.
3. More middorsal scales than: *lumbricalis*, *pusilla*, *monensis* (average), *rostellata* (average), *syntherus* Thomas (average).
4. Lack of contact of the preocular with the second supralabial versus presence of contact in: *biminiensis* Richmond, *caymanensis*.
5. Two postoculars versus one in: *biminiensis*, *caymanensis*, *sulcata*, *haitiensis*, *syntherus*.
6. Fewer middorsal scales than present in: *biminiensis*, *haitiensis*, *dominicana* (average).

The above information is taken from the literature and from personal observation. *Typhlops* sp. from the island of Guadeloupe immediately to the south of Montserrat is currently under study by Neil D. Richmond; specimens I have examined of this form attain a much larger size than *monastus* and have 24 scale rows on the anterior part of the body.

The geographical distribution of the *jamaicensis* complex is puzzling. If the forms involved do comprise a natural group it is strange that Hispaniola should lack a member. However, such gaps in distribution are not entirely unknown in Antillean reptiles. The *scaber* group of *Sphaerodactylus* which inhabits Cuba and Hispaniola has its nearest relatives in the Lesser Antilles but none in Puerto Rico. The *bilineatapyrites* group of *Leptotyphlops* has one member in Hispaniola and another in the southern Windwards (Thomas, 1965a). Such distributions may be relict; this is almost certainly the case with *Leptotyphlops*. They may on the other hand be due to the vagaries of dispersal; or, in the case of animals like *Typhlops* in which relatively few taxonomic characters are used, the "missing" member may be merely hidden by evolutionary alteration of one or two of the group characters.

*Habitat*: On Montserrat *T. monastus* preferred open or not heavily wooded habitats. Despite considerable collecting in wet, wooded montane areas, only one specimen and a clutch of eggs were found in such a situation. The others were found in open pastureland, cultivated clearings, sparse, intermediate level woods, scrub transitional between more arid lowlands and the mesic interior, or in the open fern growth found in many parts of the island. Elevation, however, was not a factor, for specimens were taken in some of the higher areas investigated. On Antigua, specimens were collected in an artificially mesic area of human habitation, where they were taken under a compost pile and beneath piles of palm trash. Another region successfully collected was a mesic ravine in the low hills on the southern part of the island. The specimen from Great Bird Island was taken under a rock on a beach about 20 feet from the water's edge; a low, succulent halophyte

was growing in the immediate vicinity. Barbuda is an even more xeric island than Antigua. One specimen was collected under a rock in a stone wall in an exposed situation in Codrington (Wayne King, pers. comm.). The ASFS St. Christopher specimen was collected in rain forest, and the Nevis specimen was collected in a maritime *Coccoloba* habitat.

*Etymology and orthography:* *Typhlops* is a Greek compound noun of feminine gender as Savage (1950) has pointed out. Of the names proposed, *monastus* (from the Greek for monastery) is a noun used in apposition to the generic name, and *geotomus* (from the Greek for ploughing) is an adjective in which the masculine and feminine endings are identical, as is also the name *syntherus* (Thomas, 1965b).

*Specimens examined* (other than holotypes and paratypes designated above): *Typhlops jamaicensis*, 86 ASFS specimens; *Typhlops richardi* (see Thomas, 1966) plus 25 additional ASFS specimens; *Typhlops monensis*, 5 ASFS specimens.

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